National Aeronautics and Space Administration
Headquarters
Washington, DC 20546-0001

February 19, 2009

Reply to Attn of: Office of the Chief Engineer

TO: Distribution

FROM: Chief Safety and Mission Assurance
Chief Engineer

SUBJECT: Lessons Learned/Knowledge Sharing Letter

We are writing to request your active participation in addressing an issue of critical importance to the long-term health of NASA. NASA makes significant investments in the intellectual capability of our workforce, but all too often we do not make time available to capitalize on these investments. Our technical workforce possesses a depth and diversity of expertise that is second to none in the world, yet we leverage only a fraction of our capacity to share our knowledge and lessons learned with each other. At the senior leadership level, we trust that grassroots efforts will take care of this, but we do not expend enough personal effort supporting these activities from the top.
This is not a new concern. In 2003, the Columbia Accident Investigation Board concluded that, "NASA's current organization…has not demonstrated the characteristics of a learning organization."[1] Many high-reliability organizations wrestle with this issue. The recent news about the "Spirit of Kansas" B-2 stealth bomber crash,[2] where a technique learned by some flight and maintenance crews but not others probably would have prevented the accident, is a dramatic reminder that knowledge sharing is not "nice to do" – it is "must do."

For many of our hardest learned lessons, we have gone to great lengths to institutionalize knowledge in design principles and flight rules, such as the GSFC GOLD rules,[3] JPL Design, Verification/Validation & Ops Principles for Flight Systems,[4] and JSC Design and Procedural Standards.[5] We also have conducted extensive outreach across our community to ensure that agency-wide procedures such as NPR 7120.5D and NPR 7123.1A reflect state-of-the-art practices in project management and systems

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[1] http://anon.nasa-global.speedera.net/anon.nasa-global/CAIB/CAIB_lowres_intro.pdf
[2] http://www.cnn.com/2008/US/06/06/crash.ap/index.html#cnnSTCVideo
[3] http://gsfcrules.gsfc.nasa.gov
[4] http://nen.nasa.gov/syseng/43913-Design-Principles.pdf
[5] http://server-mpo.arc.nasa.gov/Services/CDMSDocs/Centers/JSC/Dirs/JPR/JPR8080.5A.pdf

engineering.[6] We need to be vigilant in continuing to improve and grow these efforts to institutionalize our lessons and share these capabilities across the agency.

Our efforts to record knowledge and lessons at an institutional level in our processes and procedures are necessary but not sufficient. Within the context of NASA, learning has to take place on three levels. It has to reach our *individual practitioners*, through job assignments, formal training, knowledge sharing workshops, and membership in communities of practice. It also has to take place among our *teams*, through either sharing workshops or one-on-one mentoring and coaching. Finally, learning has to occur at the *organization* level. With our field centers spread around the country, there are very few built-in opportunities for cross-pollination among the technical workforce, so we have to employ through cross-agency knowledge sharing initiatives such as case study workshops, forums, publications, and communities of practice to build a broader learning organization.

NASA continues to implement new and innovative ways for our workforce to share their knowledge as part of their normal everyday work. It is critical that we support the capability to document and store our rich history in the form of lessons and knowledge in searchable and discoverable formats. We must ensure that we use technology so that it is a complement to (and not a substitute for) our face-to-face activities. The NASA Engineering Network[7] offers easy methods to search for lessons and knowledge across the agency, and serves as a central portal for communities of practice in specific technical disciplines. With the addition of an open format lesson submission to NASA's Lessons Learned Information System (LLIS),[8] our workforce can easily save daily work products containing valuable lessons and related contextual information with a few simple key strokes.

Examples of other key agency-wide resources include:

- Process Based Mission Assurance Knowledge Management System video nuggets and case studies[9]
- NASA Safety Center's Cases of Interest[10]
- Courses, forums (captured in a video library), case studies, and publications such as ASK Magazine and ASK the Academy offered by APPEL[11]

Use of agency-wide resources help to advance and increase knowledge sharing across our workforce.

There are specific steps you can take to improve NASA's performance as a learning organization. At the conclusion of every significant development under your

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[6] http://nodis3.gsfc.nasa.gov/lib_docs.cfm?range=7___

[7] http://nen.nasa.gov/

[8] http://nen.nasa.gov/portal/site/llis/LL/

[9] http://pbma.nasa.gov/videolibrary_main

[10] http://nsc.nasa.gov/Services/Knowledge-Management/coi.php

[11] http://appel.nasa.gov/node/32

leadership—when projects, instruments, subsystems, elements completes its work—the team involved should convene a sharing workshop to reflect on and capture its lessons learned. This shouldn't wait until after launch or closeout; it should take place immediately after the team has finished its major effort, while teams are still assembled and while memories are still fresh.

As a leader, you can play a critical role by modeling behaviors conducive to learning at the highest level of your organization. By holding your own internal sharing workshops and attending open-door knowledge sharing forums, you can send a powerful signal about the importance of making time for these activities. Your example can also encourage participation in activities that foster individual reflection about lessons learned, such as writing articles for practitioner-focused publications.

We must not forget the risk that we accept if we do not take the time to encourage our workforce to engage in sharing NASA's lessons and knowledge. We cannot afford to lose sight of the importance of continuing to improve our performance as a learning organization. Thank you for taking the time to help us institutionalize the sharing of knowledge and lessons learned from the top down. Your leadership in this area will make a real difference.

Bryan O'Connor

Dr. Michael G. Ryschkewitsch

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